Device to Address the Competing Needs of Ensuring Lockability of Seat Belts and Mitigating Entrapment Risk in Mis-Use Conditions

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Description:

The Federal Motor Vehicle Safety Standard (FMVSS) No. 208, “Occupant crash protection,” requires that passenger seating positions of passenger cars and some other passenger vehicles have a seat belt assembly whose lap belt portion is lockable so that the seat belt assembly can be used to tightly secure a child restraint system. FMVSS No. 208 further specifies that the means to lock the lap belt portion of the seat belt assembly shall not consist of any device that must be attached by the vehicle user to the vehicle and shall not require any inverting, twisting, or deforming of the belt webbing.

Vehicle manufacturers have met the lockability requirement in FMVSS No. 208 by two possible means: a switchable retractor (switching from an emergency locking retractor (ELR) to an automatic locking retractor (ALR)) and a locking latchplate. Of the two means, the switchable retractor is most commonly used. However, there have been cases where children in the rear seat have accidentally activated the ALR mode (often by misuse of the seat belt) and caused entanglement of the seat belt around the child’s body parts. In some cases, the belt had to be physically cut to release the occupant. The locking latch plate method is less popular because the lap belt does not automatically adjust to fit snugly around a child restraint system and results in slack in the lap belt

portion of the seat belt. Additionally, a seat belt with a locking latch plate may not always retract properly into the stowed position when not in use.

Expected Phase I Outcomes:

The Phase I goal of this research project is a concept development for a device that is attached to the seat belt assembly that:

1. Achieves lockability requirements in FMVSS No. 208 (S7.1.1.5) as tested per Test Procedure 208-14 (data sheet 8) and complies with all applicable FMVSSs (FMVSS No. 208, FMVSS No. 209, and FMVSS No. 210),
2. Is easy to make it lockable – does not require complex manipulation to make the seat belt lockable,
3. Complies with comfort and convenience requirements specified in S7.4 of FMVSS No. 208 - wearing a lap/shoulder belt should be similar to current practice, easy and intuitive to use,
4. Achieves seat belt fit according to current practice (5^{th} percentile adult female, and 50^{th} percentile adult male) – the shoulder portion of the lap/shoulder belt fits snugly across the chest (away from the neck and face) and the lap portion of the belt should fits snugly low on the hips and away from the abdomen,
5. Stows the seat belt away easily when not in use,
6. Does not pose risk of entrapment when mis-used, and
7. Does not introduce new risks to occupants in a vehicle.

The awardee shall develop one or more concepts for candidate devices that meet the above requirements. Phase 1 concept development should include at least a design, supporting documentation and some simulation to evaluate its potential effectiveness. Prototypes will be accepted but are beyond the Phase I requirements.

Expected Phase II Outcomes:

For Phase II, the awardee will evaluate the candidate devices developed in Phase I and select one of the devices based on demonstrated durability, effective performance under repeated use for the lifetime of the vehicle, cost effectiveness of the device, and its versatility in incorporation into current vehicle seat belt systems. The Phase II proposal must include prototype development. NHTSA will work with the awardee to provide for prototype testing of a successful phase II award. Test costs can be considered outside the costs of the Phase II proposal.